

FACT SHEET

DIVERSIFIED SCIENTIFIC SERVICES, INC. DIRECT FIRED FUEL BOILER SYSTEM

Diversified Scientific Services Inc. (DSSI) submitted a Part B permit application to DSWM for a hazardous waste management facility permit to operate a direct fired boiler system. The boiler system currently burns waste liquid fuels for energy recovery under interim status pursuant to Tennessee Rule 1200-1-11-.09 [40 CFR Part 266]. The storage and treatment of hazardous waste in containers and tanks and the continued corrective action of solid waste management units (SWMUs) at DSSI are addressed in a separate hazardous waste permit, TNHW-102.

The boiler is equipped with a burner capable of efficiently combusting blended waste fuels that include hazardous organic chemicals, used oils and organic-bearing aqueous wastes. In addition, the burner also combusts purchased propane (LPG) for supplemental fuel. Recovered energy in the form of saturated steam from the boiler is converted to electricity through operation of a turbine/induction generator system.

The DSSI boiler system is located in the process building of the DSSI facility regulated active area. The boiler system is designed and operated in a manner to efficiently combust blended liquid waste fuels containing hazardous and low level radioactive constituents while continuously controlling system emissions within established RCRA, Clean Air Act, and radioactive materials license limits. Limiting safeguards are incorporated within the control system as logical interlocks that are based on regulations and performance testing parameters. These "boundary" operating parameters for the burner/boiler include minimum and maximum combustion zone temperature, maximum thermal input rate, and maximum waste fuel feed rate. Field instrumentation and controls are maintained to monitor and record all safety and regulated process parameters to verify the system is continuously operating within the established limits.

Beneficial capture of energy is achieved within the boiler system by recovering the heat of combustion thermal energy from both waste liquid and supplementary propane fuels through generation of steam. Maintaining the performance of the boiler system is prudent and necessary in order to maximize resource recovery.

Specific features of the DSSI boiler system are presented below.

- The DSSI boiler system is a direct energy conversion and recovery system that places waste fuel combustion flue gases in contact with the "fire tubes" of a steam generator. The water outside these tubes is converted to steam which is subsequently converted to electrical power through a turbine-induction motor generator system.

- The burner combustion chamber and boiler furnace sections are of integrated design and construction. Waste fuel combustion generated flame and gas propagates from the burner into the boiler furnace section directly where energy recovery is accomplished.
- The DSSI boiler system average thermal energy recovery efficiency is maintained at greater than 60 percent.
- The types of wastes normally received by DSSI to be used as beneficial fuels include hazardous and/or low level radioactive organic wastes including solvents, used oils and also organic bearing aqueous wastes. The concentration of contaminants in the waste fuels is controlled through blending, and final analysis prior to processing. Projected contaminant feed rates are compared to demonstrated limits to establish the maximum allowable waste fuel feed rate to the burner. This feed rate is never exceeded during boiler waste fuel operation. Additionally, the heat of combustion of the blended fuels is controlled to greater than 5,000 BTU/lb_m.
- The DSSI boiler system burner is designed and operated to combust propane gas and waste liquid as fuel sources. The burner combusts commercially purchased propane to bring both the burner and boiler to operating temperature and pressure prior to the feeding of waste fuel into the burner. Waste fuel feed is mass flow-rate controlled based upon set-point flow and the propane input is modulated to maintain the boiler set-point operating pressure. Combustion air is supplied to the burner at a controlled rate based upon preset air-to-fuel ratios and set-point combustion oxygen levels.
- A main plant distributed control system (DCS) in conjunction with extensive field process sensors, monitor all boiler system operating conditions including temperatures, flow rate, pressures, etc. In the event that an operating condition approaches an established compliance limit, the flow of waste fuel will automatically be stopped. The automatic waste feed cutoff (AWFCO) logic/ parameters are electronically simulated and tested on a daily basis. And an actual physical verification test on differing parameters is performed on a weekly basis. This ensures that waste feeding will be automatically terminated prior to an operating parameter excursion beyond established boundaries.
- A continuous emissions monitoring system (CEMS) is operated to monitor the carbon monoxide (CO) and oxygen (O₂) levels within the boiler off gas. The CO concentration is maintained below 100 ppmv on an hourly rolling average, corrected to 7% O₂, on a dry gas basis. In the event that the CO concentration excursion, waste fuel feed is automatically terminated as and AWFCO.
- The boiler system maximum production rate is controlled by limiting the total thermal input of waste fuel and auxiliary propane fuel. Total thermal input is calculated and recorded based upon the heats of combustion of propane and waste fuel, and their corresponding input rate. In the event that the thermal input increases approaches the established boundary, waste fuel feed is automatically terminated as an AWFCO.

- The boiler system maximum combustion chamber temperatures are monitored and recorded. Combustion airflow rate into the burner is modulated to maintain the combustion temperatures and excess oxygen levels to ensure complete combustion of fuels. In the event that the temperatures approach the established boundaries, waste fuel feed is automatically terminated as an AFWCO.
- The boiler system off gas flow is processed through an extensive air pollution control system (APCS) which removes contaminants from the gas flow prior to atmospheric discharge. Numerous APCS operational parameters are monitored and controlled to ensure compliance with demonstrated emissions. Again, when the operational parameters approach established boundaries, waste fuel feed is automatically terminated.